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AN EVALUATION OF CERTAIN ASPECTS OF STAFF STUDY
NO. 24 OF THE ECONOMIC COUNCIL OF CANADA
ON CANADIAN AGRICULTURAL PRODUCTIVITY

I.F. Furniss

Research Division
Economics Branch
Canada Department of Agriculture



Ottawa, August 1970



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Preface

This evaluation was originally prepared in June, 1969 in response to a request by the Deputy Minister, Mr. S.R. Williams. Subsequently, Mr. Williams asked that this material be made available to all interested persons within the department. This evaluation should not, of course, be interpreted as criticism per se of the methodology employed by the Economic Council in Staff Study No. 24 but rather as an attempt to show that the cautionary preface to the Study, and quoted in the Summary to this paper, is well founded.

Additional copies, within limits, of this evaluation may be obtained from the originating office.

I.F. Furniss, Economist

AN EVALUATION OF CERTAIN ASPECTS OF STAFF STUDY
NO. 24 OF THE ECONOMIC COUNCIL OF CANADA
ON CANADIAN AGRICULTURAL PRODUCTIVITY

Summary

Staff Study No. 24 of the Economic Council of Canada, entitled "Canadian Agricultural Productivity", and authored by L. Auer, was published in December, 1969. This material first appeared as Chapter 5, "Productivity in Agriculture" in the Fifth Annual Review of the Economic Council of Canada, "The Challenge of Growth and Change", published in September, 1968. Staff Study No. 24 does not differ significantly from the form in which the material was originally published but it has been expanded by the addition of three appendices. These appendices are:

- Appendix A - Concepts, Assumptions and Limitations
- Appendix B - Data
- Appendix C - Empirical Analysis.

The study was undertaken by the author, Dr. L. Auer, as part of the Economic Council's research in areas of productivity and economic growth. It was designed to identify sources of growth in agriculture, to compare the productivity performance of Canadian agriculture with that of U.S. agriculture, and to explore the potential for further productivity gains. The author prefaces the study report in the following way:

Productivity analysis, and especially international productivity comparisons, bristle with conceptual problems and questions on comparability of data. Some of these problems were examined; others were not. This study relates to agriculture at the national level. It ignores important regional aspects of agricultural production which will be examined later /but not in this study/. Because of these limitations, the findings and conclusions of this study should be interpreted with caution.

Publication of this material in the Fifth Economic Review generated considerable interest in the public press since it purported to show that Canadian agriculture lagged behind that of the U.S.; at least, this is how many reviewers and headline writers interpreted it. The late Professor Hadley Van Vliet undertook to prepare a reply which was published in the Financial Post of September 14, 1968 (Appendix I). Professor Van Vliet put it this way:

If there is any quarrel with the Council's treatment [of the subject of agricultural productivity], it is in overdrawing inferences from its statistical base. It makes no reservations with regard to important limitations of Canadian statistics in expressing the productivity conditions or lack of comparability of much related U.S. and Canadian data.

Staff Study No. 24 generated the same kind of headlines and press comment as did the original material. One of these was an article by Michael Moore, published in the Globe and Mail of March 27, 1970 under the headline: "Farm Output Lagging Behind U.S. Gains" (Appendix II).

One of the most serious weaknesses of Staff Study No. 24 (and of Chapter 5 in the Fifth Annual Review) seems to this reviewer to be the emphasis given to absolute differences shown by various statistical averages without adequate explanation of the possible reasons for the differences. Most statistical series of the kinds employed in the study are designed mainly as indicators of relative change over time and not as measures of absolute differences. The scope, coverage and weighting of components of the data series all affect the averages computed and few of them have 100 per cent coverage (or anything near that). However, as measures of relative change, at least at the national level, they can be quite satisfactory if the

important components are adequately represented in the series and if the statistical samples are drawn so as to allow for changing structure of the industry.

The article by Michael Moore is not as biased as the headline appears to suggest. For example, he notes in paragraph six that:

Growth of labor productivity in Canadian agriculture has been at a rate roughly comparable with that in the United States and well above that recorded in other sectors of the economy.

Perhaps his editor picked the headline because it would have more readership appeal (in the Editor's viewpoint). If we accept the proposition that there is a significant difference in agricultural productivity, that is, output per man, between Canada and the United States in favor of the latter country, then Staff Study No. 24 provides an important explanation on page 13. There the reader will find a chart which shows that direct government payments to U.S. farmers as a percentage of cash receipts have exceeded those paid to Canadian farmers in almost all years since 1949. This is an important relationship supporting the hypothesis that there has been greater output per man for U.S. agriculture than for Canadian agriculture in the period under review. Professor Van Vliet drew attention to this factor also when he said:

It /the study/ understates the influence on Canadian productivity of the repressive market condition experienced by Canadian agriculture through most of the period serving for productivity comparison.

The balance of this paper is an attempt to present statistical support for the hypothesis that Canadian agricultural productivity does not differ significantly from U.S. agricultural productivity when measured

in statistically conceptually comparable ways. The material has been organized into five sections: (1) Investment and Output; (2) Type of Farming Comparisons; (3) Crop Yields; (4) Milk Production per Cow; and (5) Overall Productivity. There are nine supporting statistical tables. However, on questions like this, it is well to remind ourselves, as did an editorial in the Financial Post of December 6, 1969 (Appendix III), of the pitfalls of analysis of aggregate economic statistics. The editorial stated in the opening paragraph:

Statistics, as most people know, will support just about anyone's thesis providing the user knows which figures to choose and how to put them in the right order.

Having said this, we now proceed to present statistical material in support of the hypothesis stated at the beginning of this paragraph.

Results and Discussion

Investment and Output

Investment in land and buildings is the greatest part of the total assets of U.S. or Canadian agriculture. For Canada, it represents about two-thirds of the total while, for the U.S., it is almost 80 per cent. The U.S. situation probably reflects higher land values and more large-scale intensive livestock production requiring specialized buildings. The proportion of assets in real estate increased relatively more for Canada than the U.S. between the first half of the 1960's and the latter part. The investment in livestock and poultry and in machinery makes up a relatively larger proportion of the total in Canada than in the U.S.

Investments per man show much the same relationships as the aggregates for both countries. Total assets per man are higher for the U.S., but lower for machinery and livestock. However, there are some statistical

differences in coverage which affect these averages. For example, the value of livestock and poultry on farms in Canada includes fur animals and horses. Data for the U.S. excludes horses and mules. Thus, the livestock averages for Canada would be somewhat higher for this reason alone. The value of machinery and equipment on farms in Canada refers to the "farm share" of autos and trucks while in the U.S., 100 per cent of the automobile value apparently is included in this particular series. Thus, the average value of machinery is somewhat understated for Canada vis-à-vis the U.S.

Comparing the 1961-64 period with the 1965-68 period, there have been some important changes in the two countries. Total farm assets in Canada increased by 40 per cent compared with an increase of 23 per cent for the U.S. The increase in the value of farm real estate, 47 per cent in Canada versus 25 per cent for the U.S., accounted for most of this increase. However, employment in farming in the U.S. declined over the same years more than in Canada, 22 per cent compared with a 14 per cent decrease in Canada. Thus, investment per man in Canada increased by somewhat less than did total investment, the increase being 64 per cent compared with 59 per cent for the U.S. Investment per man in machinery rose more in the U.S. than in Canada, an increase of 59 per cent compared with 56 per cent for Canada.

The more important relationships discussed in this section are summarized in Table 1. This table shows the published data sources and notes some of the conceptual differences in the statistics employed.

TABLE 1 - DISTRIBUTION OF AGGREGATE FARM INVESTMENT AND INVESTMENT PER MAN,
CANADA AND THE UNITED STATES, 1961-64 AND 1965-68

Investment Category	Period	Distribution of Farm Assets		Investment per Man		Canada as a percentage of U.S.
		Canada	U.S.	Canada	U.S.	
		percentage of total		dollars		
Livestock and Poultry	1961-64	11.6	9.0	3,191	2,486	128
	1965-68	12.0	7.8	4,263	3,430	124
Land and Buildings	1961-64	66.0	78.4	14,377	21,673	66
	1965-68	69.6	79.6	21,800	34,959	71
Implements and Machinery	1961-64	19.4	12.6	4,218	3,491	121
	1965-68	18.4	12.6	6,560	5,542	118
Total Investment	1961-64	100.0	100.0	21,786	27,650	79
	1965-68	100.0	100.0	35,623	43,931	81

Sources: (1) D.B.S., Quart. Bull. of Agric. Statistics, Apr. - June 1966 and Apr. - June 1969. Cat. No. 21-003, quarterly.
 (2) D.B.S., The Labour Force, Cat. No. 71-001, monthly.
 (3) D.B.S., Farm Net Income, Cat. No. 21-002, annual.
 (4) U.S.D.A., Agricultural Statistics 1969.

Notes: (1) Data for Canada exclude Newfoundland insofar as investment is concerned but the labor force survey purports to include Newfoundland.
 (2) Data for U.S. exclude Alaska and Hawaii insofar as investment is concerned but the labor force includes Alaska and Hawaii.
 (3) Value of livestock and poultry for Canada includes fur animals on farms. Value of livestock and poultry for the U.S. excludes horses and mules.
 (4) Value of machinery and equipment for Canada includes "farm share" of trucks and autos. For the U.S., the value of motor vehicles is apparently 100 per cent of auto value.
 (5) Labor force data used to compute averages per man in both countries refer to total employment in agriculture and are averages of 12 monthly surveys and relate to persons 14 years of age and over.
 (6) Realized gross farm income for Canada includes cash receipts, income in kind and government payments. It excludes value of inventory changes of crops and livestock. Data for the U.S. appear to be closely comparable conceptually, and include government payments.

Realized gross farm income can be used as a rough measure of output per man. It is subject, however, to the effect of differing relative changes in prices of farm products and of the farm product mix. In the 1960's, realized gross farm income per man for Canada was somewhat less than the U.S. average. However, investment per dollar of gross income also was less. Comparing the two four-year periods, 1961-64 with 1965-68, there appears to have been some narrowing of this gap. Aside from any conceptual statistical differences, we could hypothesize several reasons for the difference but the one which seems to be most relevant would be the nature of the agricultural output mixes in the two countries. The U.S. output mix most likely contains a greater proportion of the higher-valued farm products than does the Canadian farm output mix. These higher-valued farm products are often labor-intensive farm products. However, as the domestic Canadian market grows and livestock products increase in importance, we could expect the Canadian average gross farm income to move closer to the U.S. average. This would seem to be what is happening.

Table 2 summarizes the relationships discussed.

TABLE 2 - REALIZED GROSS FARM INCOME PER MAN AND INVESTMENT PER DOLLAR OF GROSS FARM INCOME, CANADA AND THE UNITED STATES, 1961-64 AND 1965-68

Efficiency Measure		Canada	U.S.	Canada as a percentage of U.S.
		dollars		
Realized Gross Farm Income per Man	1961-64	5,466	6,340	86.2
	1965-68	8,376	9,555	87.7
Total Investment per Dollar of Gross Farm Income	1961-64	3.99	4.35	91.7
	1965-68	4.24	4.59	92.4

Source: See footnotes to Table 1.

Type of Farming Comparisons

Conceptually, and statistically, it is more difficult to make valid inter-country comparisons on a type-of-farming basis and for specific sizes of farms than it is to make aggregate comparisons, principally because of the problems of increased variability and sample size.

It appears that incomes on Canadian spring wheat farms of comparable size are similar to U.S. farm incomes, especially for the larger-sized farms. As we noted with respect to the overall averages of farm investment, the investment per man in machinery on Canadian wheat farms is higher than on U.S. wheat farms. However, the total investment per man would also appear to be higher, especially for the specialized wheat farms, but not to the same extent for the smaller Canadian wheat farms in the Parkbelt area of the Prairie Provinces. This relationship shows up particularly when we relate investment to cash receipts. In the U.S., the average seems to be between \$4.00 and \$6.00 while in Canada, it is between \$6.00 and \$9.00. However, operating expenses (including depreciation allowances), in Canada are lower than in the U.S.

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One hypothesis we might advance to explain this difference would be lower hired labor costs in Canada, principally in amount, since rates may not differ too much from those in the U.S. This hypothesis is supported too by the higher investment in machinery ratios which we noted for Canadian farms.

The relationships discussed in this section are summarized in Table 3.



TABLE 3 - SELECTED COMPARISONS OF ECONOMIC CHARACTERISTICS, WHEAT FARMS, CANADA AND THE UNITED STATES

Region, Type and Size of Farm	Average Farm Size	Net Farm Income per Farm	Investment per Man		Cash Receipts per Man	Total Investment per Dollar of Cash Receipts	Cash Receipts per Dollar of Operating Expenses
			Machinery and Equipment	Total			
United States (1967)							
Northern Plains Area:							
Wheat, small grains and livestock	800	7,169	12,012	66,759	12,621	5.45	2.04
Wheat, corn and livestock	590	12,887	6,664	50,291	11,785	4.27	2.71
Wheat, fallow	919	8,136	10,237	71,076	12,234	5.81	2.22
Southern Plains:							
Winter wheat	850	10,695	6,758	88,542	11,372	7.79	2.19
Canada (1968)							
Prairie (Elbow-Hawarden):							
Wheat:							
180- 640 ac.	617	2,674	24,959	96,453	11,272	8.54	1.43
600-1,440 ac.	1,129	6,398	35,685	158,919	16,521	8.58	1.73
2,000-3,200 ac.	2,535	15,508	40,352	224,303	25,561	8.73	2.06
Parkland (Wheat):							
Wheat:							
240-400 ac.	374	3,449	13,086	58,296	9,119	6.29	1.75
440-680 ac.	659	6,212	24,963	93,044	13,612	6.26	1.68
Grain - Beef:							
240-400 ac.	482	3,979	8,758	43,733	6,985	6.26	1.75
600-800 ac.	500	6,512	12,661	69,959	10,464	6.68	1.75
Sources: (1) U.S.D.A., Farm Costs and Returns: Commercial Farms by Type, Size and Location, ERS, Washington, Bull. No. 230, Sept. 1965.							
(2) B. Mindlemis and M. Paqueh, Costs and Returns: Commercial Wheat Farms, Prairie Provinces, 1968.							
(3) Ibid., Wheat and Beef: Prairie Provinces, Part III, 1968.							

Crop Yields

The Economic Council of Canada, Staff Study No. 24, compared yields of all wheat in Canada with all wheat in the U.S. Since the U.S. average contains a much higher proportion of winter wheat than does the Canadian average, we would expect, for this reason alone, that the U.S. average would be higher. This is because winter wheats are somewhat higher yielding than spring-sown wheats, principally because of the longer growing season and possibly more favorable harvesting conditions.

When spring wheat yields in Canada are compared with spring wheat yields in contiguous U.S. states in the spring wheat area, and after allowing for year-to-year variability, there does not appear to be any significant difference in average yields. Thus, for the period 1961-65, yields averaged 20 bushels per acre in both countries. Again, for grain corn, which in Canada is largely limited to southern Ontario, yields are closely comparable and in recent years have been 80 to 85 bushels.

The yield data discussed are summarized in Table 4.

TABLE 4 - YIELDS PER ACRE OF SPRING WHEAT AND GRAIN CORN, SELECTED REGIONS OF CANADA AND THE UNITED STATES, 1961-65 AVERAGE AND 1966 TO 1968 BY YEARS

Province/State, Region and Crop	1961-65	1966	1967	1968
bushels per acre				
<u>Spring Wheat</u> ^{a/}				
Manitoba	21.4	24.3	25.6	26.8
Saskatchewan	19.2	27.7	17.2	19.6
Alberta	21.6	29.4	22.7	25.7
3-Province Average ^{c/}	20.0	27.7	19.4	21.8
Minnesota	24.0	22.1	31.7	31.7
North Dakota	19.7	21.5	21.5	25.9
Montana	17.8	21.0	17.8	21.5
3-State Average ^{c/}	19.7	21.4	21.9	25.6
per cent				
3-Province average as a percentage of 3-State average	101.5	129.4	88.6	84.5
bushels per acre				
<u>Grain Corn</u> ^{b/}				
Southern Ontario	76.1	84.4	85.8	85.5
Western Ontario	71.1	73.6	84.4	85.4
Michigan	62.8	67.0	65.0	76.0
Wisconsin	72.1	85.0	80.0	93.0
Minnesota	62.6	76.0	72.0	81.0
Iowa	78.4	89.0	85.0	93.0
4-State Average ^{c/}	72.4	83.6	79.7	88.6
per cent				
S. Ont. as a percentage of 4-State average	105.1	101.0	107.6	96.5

a/ On basis of seeded acreages.

b/ On basis of acreage harvested as grain.

c/ Weighted averages.

Sources: (1) D.B.S., Quart. Bull. Agric. Stat., Cat. No. 21-003, Oct.-Dec. issues.
 (2) U.S.D.A., Agricultural Statistics 1969 (and earlier issues), Tables 3, 39.
 (3) O.D.A.F., Agric. Stat. for Ont. 1968 (and earlier issues), Pub. 20.

The difficulties encountered in making comparisons for specific types and sizes of farms, referred to previously, are evident in the data presented in Table 5, which for Canada are 1968 data only. Even here, however, we would have to conclude that no significant differences can be shown to exist. The data for Canada would seem to indicate two things:

- (1) yields are lower in the prairie area than in the parkbelt area; and
- (2) yields do not differ within these zones as between farm sizes.

The data for the U.S. would seem to support our earlier findings that U.S. spring wheat yields (on fallow) are about 20 bushels per acre while winter yields are a bushel or two per acre higher. Data on winter wheat yields in Canada on a comparable basis do not appear to be available.

One difference which we should note as between U.S. and Canadian crop statistics is that most crop yields in the U.S., including wheat, are available on a seeded or on a harvested acreage basis. The latter figure is always the higher. For Canada, our crop statistics are only available on a seeded acreage basis. Grain corn presents a particular problem in crop reporting since corn sown for grain may end up being harvested as silage under certain circumstances.

TABLE 5 - SELECTED COMPARISONS OF WHEAT YIELDS BY TYPE AND SIZE OF FARM,
CANADA AND THE UNITED STATES

	6-Year Average 1957-59 and 1965-67	1967	1968
	bushels per acre		
<u>United States</u>			
Northern Plains:			
Wheat, small grains and livestock	20.2	21.0	
Wheat, corn and livestock	28.6	19.6	
Wheat, fallow	18.7	20.0	
Southern Plains:			
Winter wheat	20.5	20.8	
<u>Canada</u>			
Prairie area:			
460- 640 ac.			13.8
800-1,440 ac.			15.2
2,000-3,200 ac.			15.2
Parkbelt Wheat farms:			
240-400 ac.			25.4
440-680 ac.			25.4
Parkbelt Grain-beef farms:			
240-400 ac.			24.4
440-680 ac.			23.7

Sources: See footnotes to Table 3.

Notes: (1) Durum wheat excluded.

(2) Yields of wheat on fallow and on stubble.

(3) Farms in Canada are grouped by improved acres.

Milk Production per Cow

The statistics usually employed to measure trends in milk production per cow are summarized in Table 6 for Canada, Ontario, British Columbia and the U.S. The averages for Canada have been consistently less than the U.S. averages in all years since 1961. The relative change also appears less for Canada. For example, comparing the years 1961-62 with 1967-68, the increase in milk production per cow in Canada has been 12 per cent compared with 20 per cent in the U.S.

TABLE 6 - MILK PRODUCTION PER COW, CANADA AND THE UNITED STATES, 1961 TO 1968

Year	Canada	Ontario	British Columbia	United States
pounds of milk per cow				
1961	6,140	6,319	9,526	7,290
1962	6,256	6,610	9,483	7,496
1963	6,416	6,946	9,451	7,700
1964	6,504	7,160	9,921	8,099
1965	6,569	7,448	10,056	8,304
1966	6,874	7,485	10,852	8,507
1967	6,832	7,185	10,919	8,797
1968	7,008	7,338	11,175	9,006

Sources: (1) D.B.S., Dairy Statistics, Cat. No. 23-201, Annual.
(2) U.S.D.A., Agricultural Statistics 1969, p. 373.

Notes: (1) Average production per cow is calculated for Canada and each province by dividing total estimated production (including that fed to calves) by the number of cows and heifers, two years old and over, milking or to be milked, on farms at June 1.
(2) Average production per cow for the U.S. is calculated by dividing total estimated production, excluding milk suckled by calves, by the number of cows and heifers, two years old and over kept for milk. The number used is the annual average numbers on farms during the year, excluding heifers, two years old and over not yet freshened.
(3) U.S. data include Alaska and Hawaii.
(4) Canadian data exclude Newfoundland.

Although these statistics should be satisfactory indicators of relative change over time, they cannot be considered to be suitable measures of absolute levels, since they are not conceptually comparable. For the United States there are two distinct series of numbers of milk cows on farms. Quoting from the U.S.D.A.'s Agricultural Statistics 1969, page 364, we have the following explanation:

One series entitled "Cows and heifers 2 years old and over kept for milk, January 1" is an inventory number of this specific age-sex classification which is estimated as one of the major groups making up the total cattle population at the beginning of the year. The other series, identified as "Milk cows on farms", is an annual average number of milk cows during the year (excluding any not yet fresh) which is used in connection with determining milk production. More animals are represented in the first series than in the latter because heifers 2 years of age which have not freshened, are included.

Average milk production is determined in Canada by taking the total annual estimated milk production, including that fed to calves, and dividing it by the number of cows and heifers, 2 years old and over, milking or to be milked on farms on June 1. Thus, there are two basic statistical reasons for differences in the levels of production per cow in Canada and the U.S. Since the Canadian figure includes heifers 2 years old and over which have not yet freshened, while the U.S. average does not, we would expect the Canadian average to be lower. Secondly, the Canadian average is determined from a count of the number of cows at one date only (June 1) while the U.S. figure is based on an annual average number of cows. What difference this would make is difficult to determine but, we can assume on the basis of other statistical series, that there would be some significant differences.

Average milk production is highest in British Columbia of any Canadian province. It is considerably higher than the U.S. average and also higher than that for the adjoining state of Washington. Production per cow in the State of Washington was 10,040 pounds in 1967 and 10,500 in 1968. Aside from the statistical differences noted, we would expect that the characteristics of the milk cow populations in British Columbia and Washington State would be the most nearly comparable for any two states or provinces in terms of breed and age distributions, and also in such other factors as management and climate.

Attempting to compare production per cow between Canada and the U.S. on the basis of statistics for breed associations is no more satisfactory because of differences in weighting by breeds, age, and other factors. The data available are reported in Tables 7 and 8.

TABLE 7 - UNITED STATES DAIRY HERD IMPROVEMENT ASSOCIATIONS, 1961 TO 1968
(STANDARD PLAN)

Year	Associations	Cows on Test	Cows per Herd	Average Milk Production
	number	thousands	number	pounds
1961	1,395	1,867	43.9	10,796
1962	1,436	1,958	46.6	11,032
1963	1,441	2,007	47.8	11,286
1964	1,420	2,010	49.4	11,685
1965	1,424	2,088	52.1	11,976
1966	1,418	2,059	52.9	12,127
1967	1,344	2,099	55.7	12,307
1968	1,318	2,132	57.8	n.a.

n.a. = not available at this date.

Source: U.S.D.A., Agricultural Statistics 1969, p. 372.

TABLE 8 - ONTARIO DAIRY HERD IMPROVEMENT ASSOCIATIONS, 1967 AND 1968

	1968		1967	
	Number of records	Milk Production per cow (pounds)	Number of records	Milk Production per cow (pounds)
<u>Age Class</u>				
2-yr old	7,789	9,395	7,837	9,611
3-yr old	6,612	10,409	6,347	10,538
4-yr old	5,207	11,344	5,570	11,341
Over 4-yr old	12,524	11,627	12,000	11,617
<u>Month of Calving</u>				
January	2,599	11,210	2,929	11,058
February	2,336	11,216	2,305	10,812
March	3,926	11,046	4,135	10,916
April	3,146	10,626	3,099	10,688
May	2,232	10,562	2,237	10,643
June	2,020	10,387	1,836	10,415
July	2,166	10,197	1,943	10,286
August	2,178	10,203	1,937	10,505
September	2,719	10,416	2,561	10,815
October	3,072	10,857	2,834	11,045
November	2,765	11,174	2,995	11,324
December	2,973	11,170	2,943	11,175
Year	32,132	10,758	31,754	10,858
<u>Holsteins</u>				
A.I.	13,454	11,232	13,792	11,389
"Natural"	4,310	10,977	4,337	10,963 ^{a/}
Grade	8,475	11,310	8,281	11,464
Registered	21,432	10,880	21,220	10,936 ^{a/}

a/ These averages are reported as given in the cited source but there may be a typographical error involved. The D.H.I.A. report does not provide any means of checking this.

Source: Ontario Dairy Herd Improvement Associations, Progress Report 1967, 1968, O.D.A.F. Toronto.

Average milk production for all U.S. Dairy Herd Improvement Associations in 1967 was reported to be 12,307 pounds (Table 7). This compares with 10,856 pounds for all Ontario D.H.I.A. herds; with 11,617 pounds for all mature cows under Ontario D.H.I.A.; and with 11,464 for all grade Ontario D.H.I.A. herds.

Within the U.S. itself, average milk production varies between states and regions. For example, in 1968, the lowest average milk production was reported for Mississippi (5,230 pounds) and the highest for California (11,460 pounds). On a regional basis, the lowest average milk production was reported for the South Central region, which includes Mississippi, at 6,763 pounds. The highest was for the western region (10,424 pounds), reflecting largely the influence of California. In 1968, average milk production in Canada was 7,008 pounds. This falls between the average for the U.S. South Atlantic region (7,876 pounds) and the U.S. South Central region (6,763 pounds).

We can conclude only that the data presented do not refute the hypothesis that average milk production, measured on a statistically comparable basis, is lower for Canada than the U.S. However, the data do suggest that for comparable ages, breeds and other factors affecting output per cow, there would be no significant differences.

Overall Productivity

In the 1960's, the relative growth in overall agricultural productivity (output per unit of input) for Canada appears to have exceeded that for the United States according to one statistical measure (Table 9). Overall productivity for Canadian agriculture rose by 2.4 per cent a year from 1960 to 1969. This was the result of a growth rate of 3.6 per cent in gross output

while inputs rose by 1.1 per cent a year. In the U.S., the overall growth rate in productivity has been much less than in Canada, 0.3 per cent a year, reflecting a growth rate in output of 1.6 per cent, much less than for Canada, and an annual increase of inputs of 1.3 per cent - higher than the rate for Canada. However, when we relate the value of production to the size of the farm labor force, also a measure of productivity but more specifically of labor productivity, we find that, in terms of the number of persons supplied food and fibre by one farm worker, the growth rate for the U.S. has been higher than for Canada. This probably reflects the slower rate of decline in the Canadian farm labor force than that for the U.S. In this particular series, the Canadian data reflect year-to-year variations in output more than do the U.S. data. It does appear, however, that there has been an important reversal of trend in recent years, that is, since 1966. Up to this year, the Canadian ratio had exceeded the U.S. ratio (since 1960) and generally advanced at much the same rate. But, in both 1967 and 1968, the Canadian ratio lay below the U.S. ratio. This does suggest that there has been a significant change in the economic climate since 1966 which has affected Canadian agriculture but has not had the same impact, if any, on U.S. agriculture.

TABLE 2 - OVERALL AGRICULTURAL PRODUCTIVITY COMPARISONS, CANADA AND THE UNITED STATES, 1960 TO 1969

Year	Canada			United States			Number of Persons	
	Farm	Production	Productivity	Total	Total	Productivity	Supplied with	
	Output	Inputs		Output	Inputs		Farm Products by	
							One Farm Worker	
							Canada	United States
		1949 = 100			1950 = 100			
1960	133	94	141	123	100	123	27.7	25.8
1961	146	95	122	124	100	124	21.4	27.6
1962	145	95	153	126	100	126	30.8	28.6
1963	160	97	165	130	103	126	32.2	30.7
1964	149	98	152	129	103	125	37.2	33.2
1965	160	92	162	133	103	129	38.8	37.0
1966	180	100	180	131	106	124	44.8	39.6
1967 ^{a/}	153	103	153	137	108	127	40.5	42.1
1968 ^{a/}	170	102	166	140	110	127	40.9	43.4
1969 ^{a/}	176	102	172	141	111	127	39.1	-

^{a/} Preliminary.

Sources: (1) Economics Branch, C.D.A., Ottawa.
(2) U.S.D.A., Handbook of Agricultural Charts, 1969, pp. 16, 20.

AGRICULTURE PRODUCTIVITY GAP IS NOT REALLY WIDENING AT ALL

By Dr. Hadley Van Vliet

The gist of the Economic Council's comment on agriculture is that the industry is suffering from low productivity. It suggests that, notwithstanding very significant progress in output per worker in Canadian agriculture, a tripling over the past 20 years, it is still 25% - 35% less efficient than U.S. agriculture.

The Council suggests, moreover, that the spread between Canadian and U.S. output per worker has been widening rather than narrowing. It lays the difference to lower mechanization of Canadian agriculture and to less effective application of yield technology in both crop and animal phases of production, with indications that Canada has been falling behind particularly in the latter area.

The main theme of the comment, emphasizing a gap and a possibly increasing lag in productivity of Canadian agriculture, is well taken. It serves as a timely admonition in the present situation of intensified competition in the international wheat market. Use of the U.S. for its main comparisons is particularly appropriate in view of both the wheat-export competition and broadening import competition coming from this source.

No reservations

If there is any quarrel with the Council's treatment, it is in overdrawing inferences from its statistical base. It makes no reservations with regard to important limitations of Canadian statistics in expressing the productivity condition or lack of comparability of much related U.S. and Canadian data.

And, while it admits to qualifying considerations in respect of a general difference in both the form and context of the U.S. industry, it offers little tempering of its conclusions in behalf of these differences.

A number of elements of statistical interpretation are much to the point. Canadian statistics of agricultural labor force afford questionable imputation of agriculturally related employment in the input sense. They do not carry clear comparability with U.S. figures, either in terms of relating to a comparable definition of agriculture or expressing a similar measure of employment. They have become increasingly muddled by the extension of part-time farming and combination employment which, for the period of comparison used, probably reflects disproportionately in the disadvantage shown for Canadian industry.

Precarious basis

In the same vein, measurement of productivity in terms of gross-output ratios, without specific amount of type-of-farming differences bearing on net productivity, and without correction for the important divergence of price levels over the comparison period, affords a precarious basis for deduction both of the extent and trend of the productivity gap.

The distortions that appear to be injected do not invalidate the essential conclusion of an uncomfortable difference in productivity. They do, however, suggest that the real gap is probably less than it is made out to be. Also, if all of the apparent qualifications bearing on the comparison were validated, they could render the deduction of an increasing productivity gap as questionable.

Indicators used to express the differences in crop and livestock yield technology between the two countries do little to salve the ego of the Canadian industry.

Using categories of enterprise-related operating expenses to represent yield-improving inputs - with U.S. cropping expenditures involving a large volume of off-farm seed purchases and livestock expenditures including major elements of feeder-livestock and feed purchases - grossly exaggerates the difference in input condition without the further qualification needed on behalf of differing product composition of industry.

When aligned with indications of crop-yield change, which is uncorrected for the important shift in cropland base, it carries a heavier bruising of the Canadian industry than is warranted.

Overlooks market

Acknowledgement of the differing market and policy contexts of the industry for the two countries gives only backhanded recognition to their productivity implications. It understates the influence on Canadian productivity of the repressive market condition experienced by Canadian agriculture through most of the period serving for productivity comparison.

Associated directly with the serious wheat surplus situation of the 1940s but transmitted to all phases of production and reinforced by the differing policy bearing on output adjustment and prices, it accounts for the basic holdback of inputs and suppression of potential productivity in the Canadian industry.

Interpretation of the Canadian position in terms of "latent" productivity has nebulous connotations but would lay claim to a closer run in productivity gains than is demonstrated by the selected experience.

While professing denial, the treatment does not suppress an inference that achieving comparative productivity is the answer to the income problem of the farming industry. Its wind-up statement of policy implications does not succeed in placing resource or labor productivity in perspective in relation to the larger agricultural problem. It leaves competitive productivity holding the spotlight by default rather than merit. The real issues of long-range agricultural policy are no clearer than before.

Useful purpose

Regardless of how it will be interpreted, the section does serve a most useful purpose in challenging Canadian agricultural industry to recognize considerations of competitive productivity.

Coming on the heels of some of the revelations concerning the Mexican hard wheats and American soft wheats, it should shake some of the complacency held with respect to Canadian wheat industry.

The Council's report should also stimulate the Canadian feed-grain industry to match some of the progress shown by U.S. corn, sorghum and soy-bean production. And it should direct attention to important concerns in cropping and, more especially, livestock production organization and to general managerial development as related to Canadian farming industry.

In the latter respect, its comments on comparative input into industry research, and the need for reviewing directions of emphasis in research, are especially cogent.

Source: The Financial Post, Toronto, September 14, 1968.

FARM OUTPUT LAGGING BEHIND U.S. GAINS

By Michael Moore

Canadian farmers have failed to keep pace with improvements in yields in other countries - notably the United States - according to a staff study released by the Economic Council of Canada.

While increases in productivity are necessary if the farmer's lot is to improve, such increases by themselves would only worsen the farmers' position.

Also needed are increases in mechanization, increases in farm size, expansion of markets, better marketing structures and continued departure of people from the industry.

Without these changes, increases in yields would only aggravate "the severity of Canada's farm income problems".

The study by Louis Auer, an economist on the staff of the council, originally was prepared as part of the background for the council's fifth annual review, which was issued more than a year ago. The farm productivity study has just been made public.

Growth of labor productivity in Canadian agriculture has been a rate roughly comparable with that in the United States, and "well above that recorded in other sectors of the economy".

The disparity in the absolute level between Canadian and U.S. farm labor productivity has widened.

In the United States, increases in mechanization and yield technology have contributed about equally to increased productivity. Canada has kept pace in mechanization but fallen behind in yield technology.

Comparisons in the study are based for the most part on the two decades prior to 1965.

While adoption of machine technology has increased and probably will continue to do so, it will be less a matter of numbers of machines and more a matter of their size.

In both Canada and the United States, the rate of increase in the number of farm trucks is slowing, "and in the United States the number of tractors has actually declined over the past five years".

The study suggests these trends are related to consolidation of farms, reduction of the number of farm workers and the resulting need for larger and more powerful machines.

While these changes are good for the industry, they can be hard on the individual and government policies are needed to ease the changes.

Unfortunately, the study says, these policies are often developed only when problems have become acute, rather than being long-run attempts to meet deep-seated needs.

Three basic characteristics of the industry cause the farmers' income problems: improvements in technology increase output faster than markets can be found; economies through mechanization require heavy investments in land, machinery and equipment, and the out-migration needed to make possible farm consolidation is a slow and difficult process.

The study shows that while the value of farm production per farm worker has fluctuated from year to year, it has been consistently lower in Canada than in the United States.

"Canadian farmers produce on the average 25 per cent less than U.S. farmers in net value, whereas in terms of gross value the disparity is about 35 per cent".

The difference is narrower for net value because the U.S. farmer buys more of his inputs from the non-farm sector of the economy.

The study compares estimates of the average annual hours worked per farmer in the United States and Canada and suggests that while the U.S. figure has dropped during the 20-year period under study, the Canadian figure started higher and dropped less slowly.

"Should these estimates be realistic, they tend to widen the productivity gap (in terms of production per man-hour) by more than 10 per cent."

During the period under review, farm labor productivity increased an average of 5.5 per cent per year in Canada, compared with 6 per cent in the United States.

Major components of this increase in Canada were loss of labor from the industry, 2 per cent, machinery, 0.9 per cent, fertilizer 0.2 per cent, and all other capital inputs 0.6 per cent.

In the United States, the labor input was 2.6 per cent, machinery was 0.6 per cent, fertilizer 0.2 per cent, and all other capital inputs 1 per cent.

Mr. Aver says the number leaving agriculture - the largest factor in increased productivity in both countries - is not rising faster in the United States than in Canada.

While the rate of productivity increase has been only slightly higher in the United States than in Canada, the cumulative effect of the difference has been to widen the gap between the outputs per worker.

"Two decades ago, the gap was in the neighborhood of \$1,000; today (1965) it is over \$3,000. Any significant narrowing of the gap would require a sharp acceleration of productivity growth in Canadian agriculture.

"Assuming that (the U.S. rate) over the next two decades were to approximate that of the past two decades, Canadian farmers would have to step up their productivity growth by more than half - from 5.5 per cent to over 8 per cent per year - to catch up to U.S. productivity levels by 1990."

More important, the average annual inputs per farm worker for the period 1961-65, were 76 per cent higher in the United States than in Canada, calculated in 1949 dollars.

In inputs relating to increased yields of crops and livestock, the U.S. figure was 160 per cent higher than the Canadian.

A major influence, the study says, could be federal government policy, which in the United States tended to reduce acreage and thereby encourage farmers to maximize their productivity on the remaining land, but which in Canada tied again marketing to amount of land under cultivation, thereby encouraging expansion rather than intensification.

"In Canada, higher crop yields accounted for 70 per cent of estimated expansion in crop production in the United States they accounted over 170 per cent and more than compensated for the negative effects of acreage reduction and shifts among crops".

During the period under study, Canadian agriculture remained devoted heavily to wheat, while the United States moved heavily into corn, sorghum, and soybeans - crops that yield more per acre. At the same time, Canada dropped further behind other wheat-growing countries in yields.

During the years under study, the major importing countries of Western Europe increased wheat yields at a rate of 0.5 to 1.4 bushels per acre each year, "which is two to five times the Canadian rate of gain".

In egg production, output per hen is closer in the United States and Canada than it was in the postwar years, but in milk production per cow the difference has increased during the same period to 25 per cent from 15 per cent.

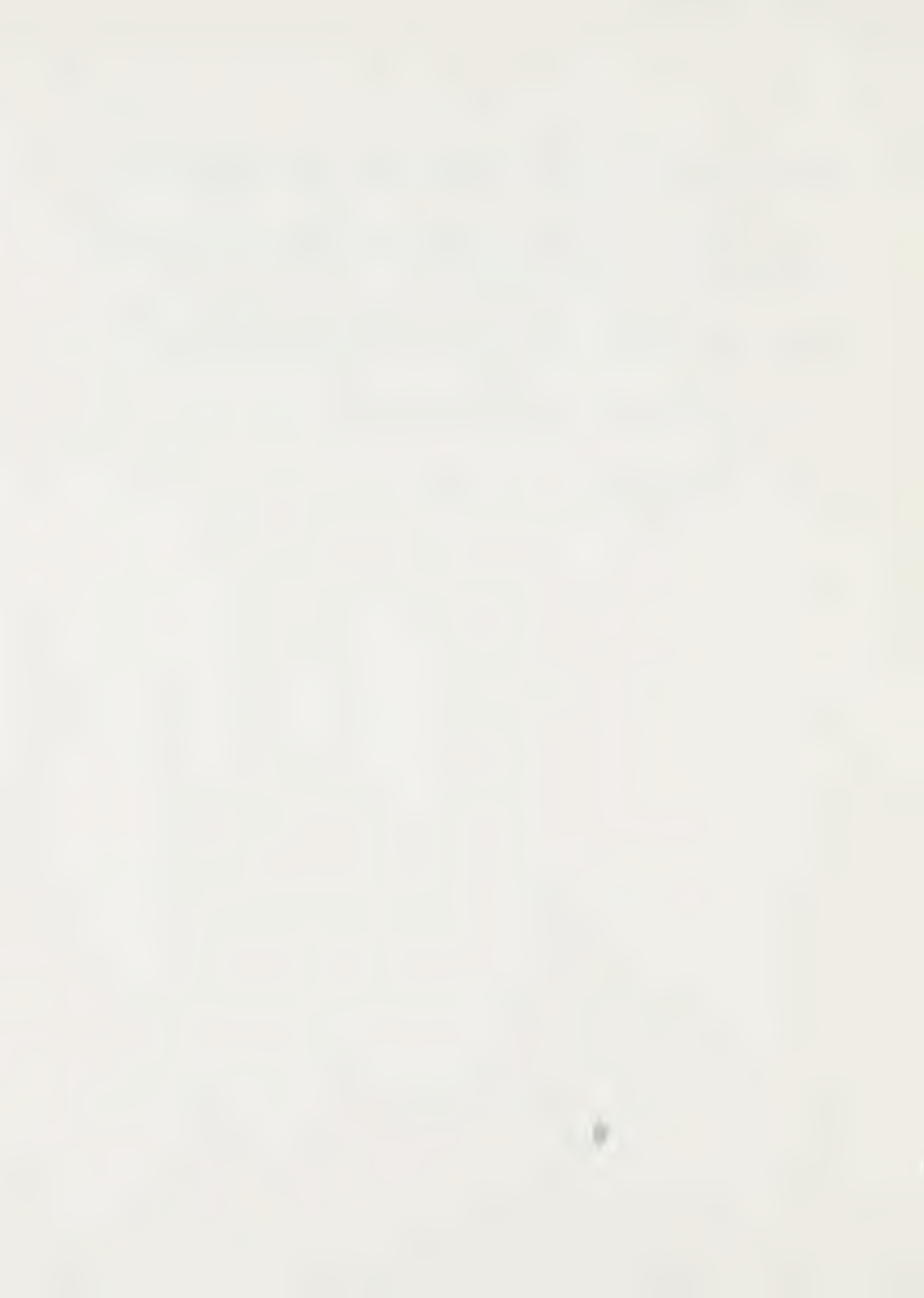
In all provinces except British Columbia, production per cow in 1965 was below the U.S. average of 8,600 pounds, and the average of all provinces was 6,500 pounds.

"These diverging trends probably reflect many factors, including lags in the adoption of efficient farm practices and gaps in research and development in the livestock sector".

Both government and private research in agriculture is lower proportionally in Canada than in the United States, and this may put the Canadian producers at a disadvantage.

"If this gap in yield technology is to be reduced, its causes must be more carefully identified".

Source: The Globe and Mail, Toronto, March 27, 1970.



NOW YOU SEE IT, NOW YOU DON'T

Statistics, as most people know, will support just about anyone's thesis providing the user knows which figures to choose and how to put them in the right order.

Take food prices. Canadian housewives complain bitterly that rising prices are making mince-meat out of their budgets. The supermarket checkout counter, to the naked eye anyway, seems to substantiate their forlorn cries.

But wait. According to a recent report of the federal Agriculture Department's Economics Branch, the poor ladies know not whereof they speak. Statistics prove that "food continues to be one of the biggest Canadian bargains".

Canadians, today, spend about 20% of their after-tax income on food. Twenty years ago, they were spending 25%.

Selected comparisons bear this out:

Using an hour's wages in 1948 (92¢), versus an hour's wages in 1968 (\$2.58), the housewife can now buy 8.4 quarts of fluid milk instead of 5.3 quarts in 1948.

In the same neat, statistical manner, she can get 2 pounds of sirloin instead of 1.5 pounds; 13.2 pounds of bread instead of 9.9 pounds; 4.6 dozen grade A large eggs instead of 1.5 dozen; and so on.

And don't forget, the study points out, that while the consumer price index increased by 36% overall in the 20 year period, the increase for food alone was "only 33%".

So there you are. Maybe Finance Minister Edgar Benson can live on \$30 a week. On the other hand, why has Health Minister John Munro just ordered a two-year survey of malnutrition in Canada?

Source: The Financial Post, Toronto, December 6, 1969.

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